M1500 / M1500T
15.0” XGA TFT NEMA 4/12
Flat Panel Monitor

User’s Guide

Document No. DOC-IWS-712C, Rel. 6-2008

Nematron

Revision List

Revision Number	Description of Change	Release Date
A	Initial Release	9-2006
B	Added Windows Vista driver to list of supported drivers, Added notes to driver list, Changed Logo, Corrected H X W Reversals on page 5	4-2007
C	Added DVI functionality, UL Hazardous Locations Notes and Warnings	6-2008

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Document No. DOC-IWS-712B M1500 / M1500T User Manual

Released 6-2008

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Chapter 1 - Introduction

The M1500 is a high performance 15" color TFT flat panel monitor specifically designed for harsh industrial environments including Class I & II, Division 2 Hazardous Locations. The M1500 accepts standard analog VGA input and can display all VESA video modes up to 1280 x 1024 at 75Hz with 16 million colors. An optional 5-wire analog touch screen is available that offers both RS-232 and USB interface capability. The monitor is housed in a heavy duty steel chassis with a powder coated machined aluminum bezel. The monitor is certified to NEMA 4/4X/12 standards, is UL/CUL listed, meets CE requirements and is RoHS compliant. Panel mounting is simplified using convenient mounting clips instead of conventional studs. Options include: a 5-wire analog resistive touch screen, a 304 stainless steel bezel and 24 volt DC input power. All monitors are shipped with a power input wiring receptacle, VGA cable, touch screen cable (if equipped), mounting hardware, manual and driver software.

Features

- UL 508 and UL 1604 listed for Hazardous Locations: Class I, Division 2, Groups A, B, C, D and Class II, Division 2, Groups F and G
- NEMA 4/4X/12 front bezel
- 2-Year warranty
- RoHS Compliant
- Integral 100 -240 VAC power supply
- Simplified installation with no studs
- Thin design – Only 2.4" behind bezel
- Accepts analog 15-pin Video input
- VESA compliant – all modes up to SXGA, 75Hz
- Optional 5-wire resistive touch screen with both RS-232 and USB interface
- Optional 304 stainless steel front bezel
- Optional 24 VDC input power

Supported PC Video Modes

Mode	Dot Clock (MHz)	Horizontal Freq (KHZ)	Vertical Freq (Hz)	H Sync Polarity	V Sync Polarity
640 x 350 @ 70Hz	25.144	31.430	70.000	P	N
640 x 400 @ 70Hz	28.287	31.430	70.000	N	P
720 x 400 @ 70Hz	28.287	31.430	70.000	N	P
640 x 480 @ 60Hz	25.175	31.469	59.940	N	N
640 x 480 @ 72Hz	31.500	37.861	72.809	N	N
640 x 480 @ 75Hz	31.500	37.500	75.000	N	N
800 x 600 @ 56HZ	36.000	35.156	56.250	P	P
800 x 600 @ 60Hz	40.000	37.879	60.317	P	P
800 x 600 @ 72Hz	50.000	48.077	72.188	P	P
800 x 600 @ 75Hz	49.500	46.875	75.000	P	P
1024 x 768 @ 60Hz	65.000	48.363	60.005	N	N
1024 x 768 @ 70Hz	75.000	56.476	70.070	N	P
1024 x 768 @ 75Hz	78.750	60.023	75.030	P	P
1280 x1024 @ 60Hz	108.000	63.981	60.020	P	P
1280 x 1024 @ 75Hz	135.000	79.976	75.035	P	P

Note: The above highlighted PC display modes produce the best image quality on the M1500.

Specifications

DISPLAY

Display Size (Active Area H x V)	11.97” x 8.98”
Native Resolution	XGA, 1024 x 768
VESA Modes Supported	Up to 1280 x 1024 @75Hz
Displayable Colors	16M
Brightness, Typical	250 Nit
Contrast Ratio, Typical	550:1
Horizon/Vertical View Angle, CR>5, Typical	160°/140°
Backlight Life	40,000 hrs, Minimum
Display Input Signal	Analog 15-Pin D-Sub

TOUCH SCREEN (Optional)

Touch Screen Technology	5- Wire Analog Resistive
Interface	USB 1.1 and Serial RS-232
Resolution	4096 x 4096
Positional Accuracy (Maximum Error)	.18”
Positional Accuracy (Standard Deviation of Error)	<.08”
Expected Life	>35,000,000 Activations

PHYSICAL

Over All Monitor Dimensions (H x W x D)	12.80” x 15.80” x 2.65”
Cutout Dimensions (H x W)	12.00” x 15.00”
Weight	12.5 lbs
Shipping Weight	15 lbs

ELECTRICAL

AC Input Voltage	100 – 240 VAC, 50/60 Hz
AC Input Current	.5A Maximum
DC Input Voltage (Optional)	18 – 36 VDC
DC Input Current (Optional)	.75 A Max @ 24VDC
Input Power	≤20W

ENVIROMENTAL

Operating Temperature	0°C to 50°C
Operating Humidity	20% to 80% RH, noncondensing
Operating Shock	15g peak acceleration, 11msec
Operating Vibration 5-2000 Hz	0.006” peak to peak, 1g max
Operating Altitude	Sea level – 10,000 feet

AGENCY

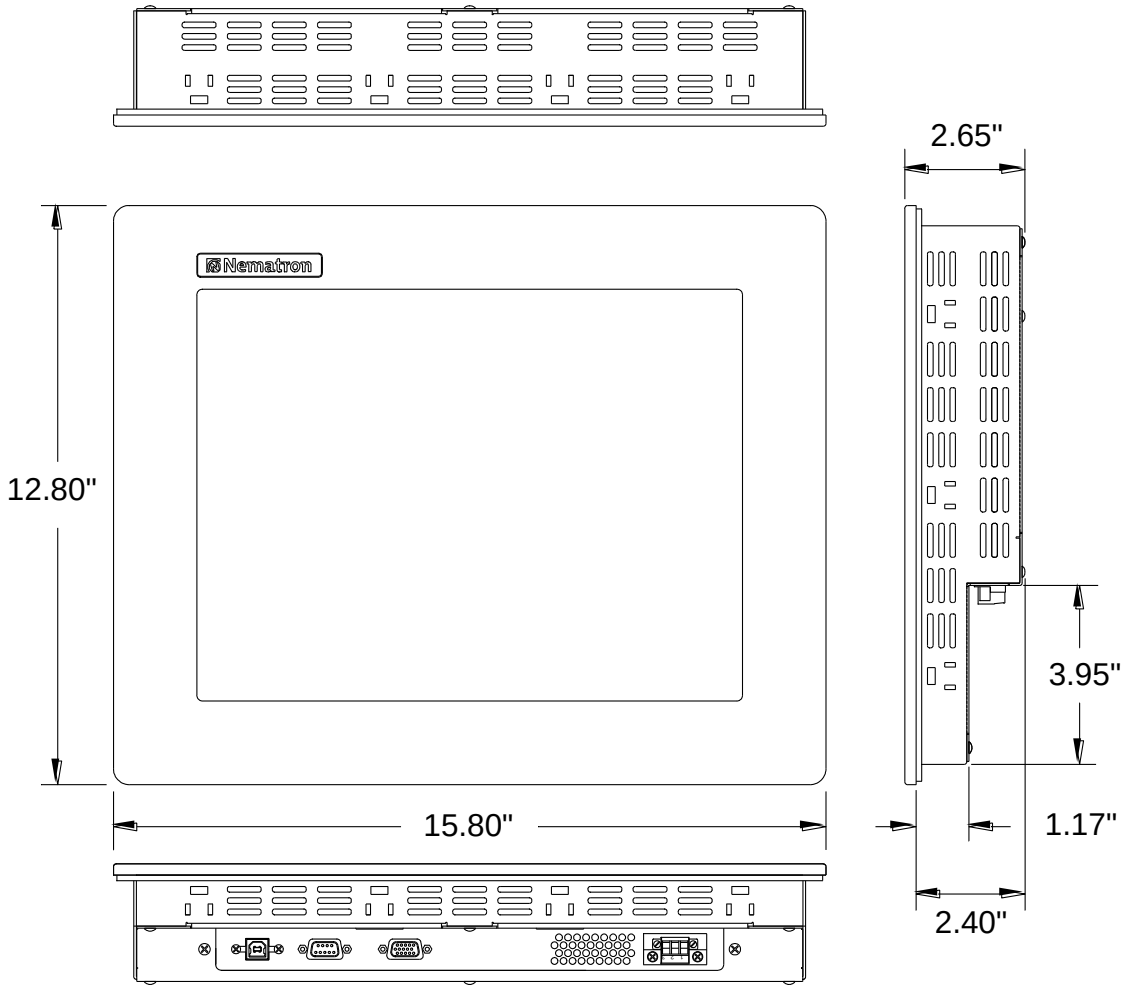
Front Panel NEMA Rating	NEMA 4/4X/12, IP65
FCC	47 CFR, Part 15, Class A
EU CE Marking Compliance	CE, EN 55022: Class A, EN 61000-3-2: Class A, EN 61000-3-3, EN 61000-6-2,
Safety Agency Approvals	UL 508 Listed, UL 1604 Listed*, cUL Listed CSA C22.2, #142, CSA C22.2, #143*

* Class I Division 2, Groups A, B, C, D; Class II, Division 2, Groups F and G

NOTE: SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C AND D HAZARDOUS LOCATIONS, OR NONHAZARDOUS LOCATIONS ONLY

WARNING – EXPLOSION HAZARD – SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2

Front and Side Views of Monitor



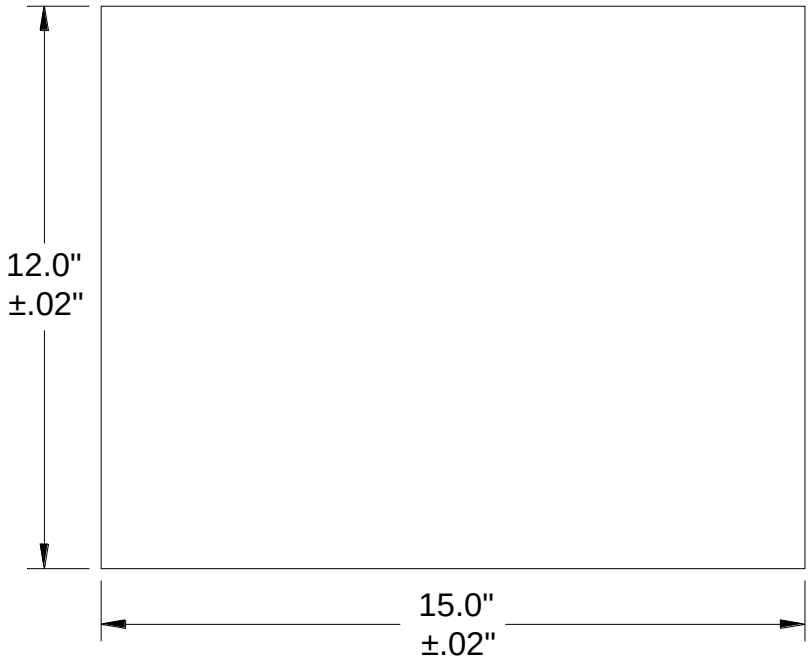
Chapter 2 - Installation of Monitor

This monitor is intended to be mounted in and used where NEMA 4 and NEMA 12 type enclosures are employed. Enclosures made of heavier gauge metal work better because they won't deform or bend as easily when the monitor's sealing gasket is compressed. The monitor meets NEMA 4/12 sealing specifications when properly installed in an approved NEMA enclosure constructed from 14-gauge or heavier steel. The monitor uses "U"-shaped clips and a special gasket to achieve the proper seal.

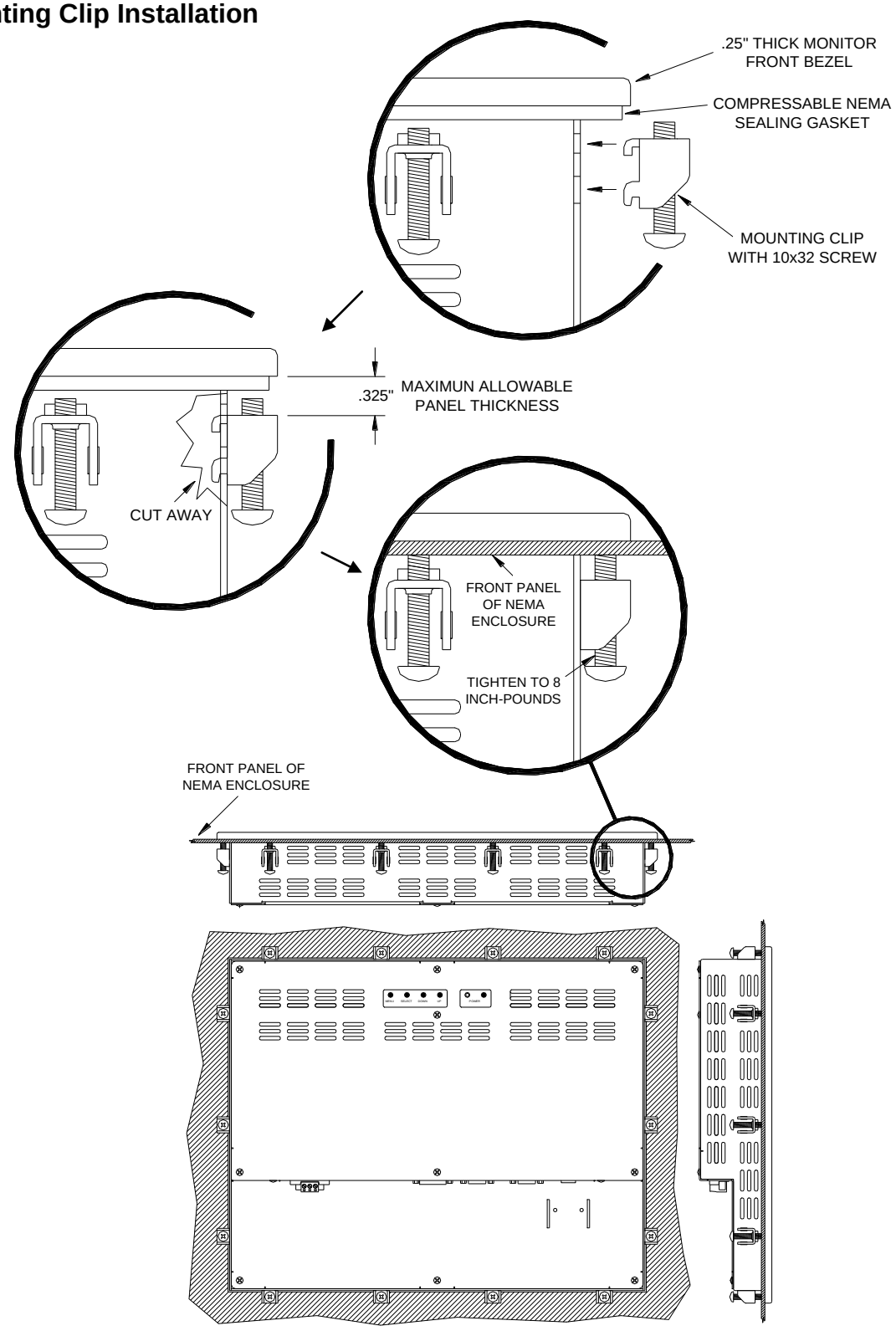
When selecting an enclosure remember to allow adequate space around the rear of the monitor for good air flow. Do not block air flow from below or above the monitor. If possible mount the monitor in a vertical orientation. The monitor is designed to work in environments up to 50 degrees Centigrade. Remember to account for heat dissipated from other equipment that may be inside the same enclosure.

To install the monitor, make a cutout according to the diagram below in one of the walls of your NEMA enclosure. Next hold the monitor in place while you install the mounting clips. Tighten the clips to the point were the back of the monitor's front bezel just begins to contact the front of the NEMA enclosure. The use of an adjustable torque driver is recommended. The screws should be tightened to 8 inch-pounds. Tighten the clips in a cross pattern. This will help to develop an even pressure on the sealing gasket. DO NOT OVER TIGHTEN AS DAMAGE CAN RESULT IN THE MONITOR CAUSING LOSS OF SEALING INTEGRITY.

Cutout Pattern for M1500 / M1500T Monitor



Mounting Clip Installation



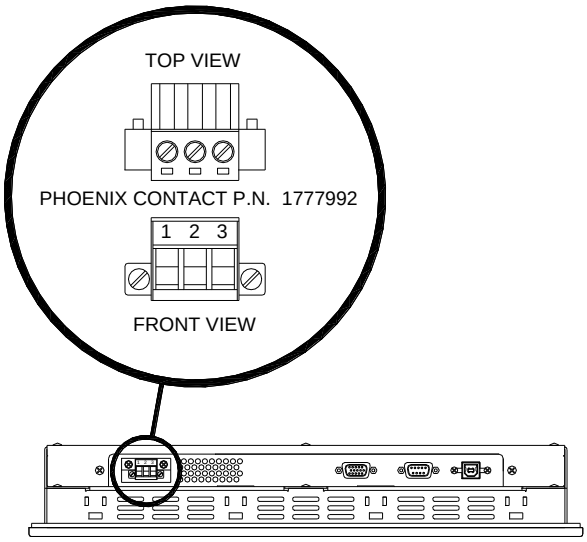
REAR VIEW OF PANEL MOUNTED MONITOR

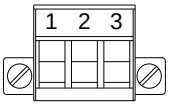
Connecting Power

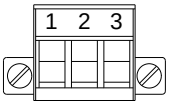
The M1500 monitor is powered from 100-240 VAC, 50/60 Hz or optionally from 24 VDC. ***Damage will occur if 100-240 VAC power is connected to an M1500 equipped with the 24 VDC input power option.*** M1500's equipped with the 24 VDC option will have a "-24" suffix in their model number such as M1500-24 or M1500T-24.

Because the M1500 is UL 1604 listed for Hazardous Location use, (Class I Division2, Groups A, B, C, D; Class II Division 2 Groups F and G: Temperature Code T4A), it has no power switch for switching off supplied power. Please read the functional description of the POWER button on page 12. Consideration should be give to the installation of an appropriately rated external power switch if the application requires powering off the M1500.

Power is connected to the M1500 through a removable Phoenix Contact plug (Phoenix Contact P.N. 1777992) that allows for screw termination of field wiring. The use of 18 AWG or greater (12 AWG maximum) is recommended. Connect the field wiring according to the appropriate table below. After the connections are made, make sure the plug retention screws (the two screws shown in the "Front View" below) are securely tightened. This will prevent the plug from pulling out.



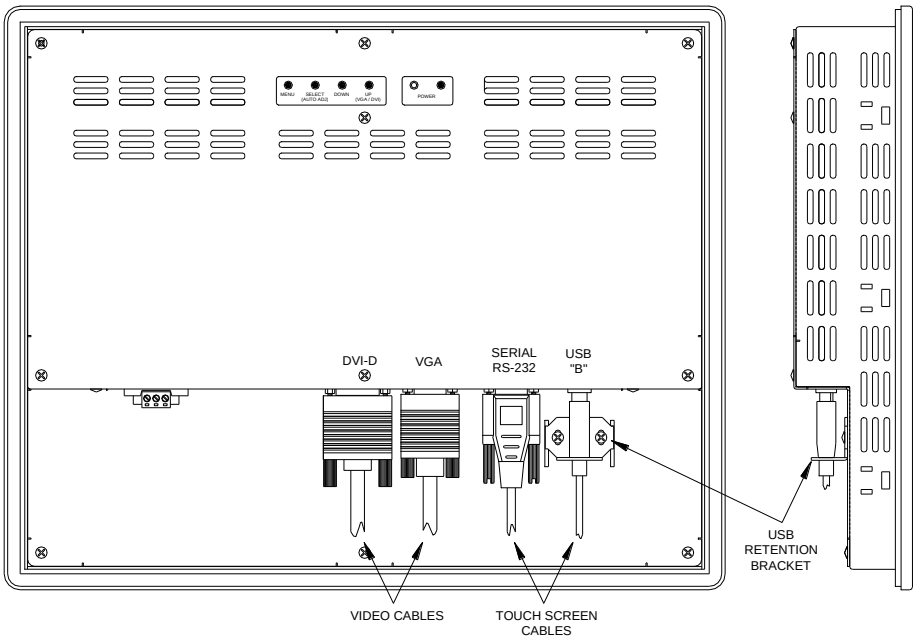
100 VAC – 240 VAC INPUT (1.0 Amps Min)		
	**PIN No.**	**Definition**
	1	AC Line Input
	2	AC Neutral Return
	3	Protective Earth Ground

18 VDC – 36 VDC INPUT (2 Amps Recommended)		
	**PIN No.**	**Definition**
	1	+DC Input
	2	-DC Return
	3	Protective Earth Ground

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOW TO BE FREE OF IGNITABLE CONCENTRATIONS.

Connection of VGA and Touch Screen Cables

Connect either a 15-pin VGA or DVI-D cable and either an RS-232 or USB cable if the monitor is equipped with a touch screen. All communication cables should include a chassis ground shield. Hazardous location, Division 2, requires that all cables have adequate strain relief. For this reason, tighten all connector thumb screws securely. If a USB cable is being used, install the provided USB retention bracket. Insert the USB connector through the square cutout in the base of the bracket and pull the cable and body of the connector back through the round hole in the bracket flange. Now insert the bracket into the two slots on the rear of the monitor and side it forward so the connector is fully inserted in the mating bulkhead connector. Install and tighten two 4-40 x .25" Philips screws.



NOTE: WHEN USING USB TOUCHSCREEN CONNECTION THE USE OF THE USB RETENTION BRACKET IS REQUIRED FOR HAZARDOUS LOCATIONS AND HIGHLY RECOMMENDED FOR NONHARDAOUS LOCATIONS.

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT WHILE THE CIRCUIT IS LIVE OR UNLESS THE AREA IS KNOW TO BE FREE OF IGNITABLE CONCENTRATIONS.

NOTE: TO PREVENT INADVERTENT DISCONNECTION OF VIDEO AND/OR SERIAL TOUCHSCREEN CABLES ASSURE THAT THE THUBSCREWS ARE SUFFICIENTLY TIGHTENED.

Turning on the Computer and Monitor

With power applied to the monitor and all cables connected you may power up the computer and press the POWER button on the rear of the monitor. The POWER LED will switch from off to green. The monitor will perform an automatic self configuration and begin displaying an image. If no image appears, it may be because the monitor has the wrong video input selected. Press the UP button on the rear of the monitor to change between VGA and DVI-D inputs. If the computer is subsequently powered off, the monitor will remain on and display the NO SIGNAL error message (page 22) indefinitely. The POWER LED remains green. The touch screen remains active during this time. When the computer is powered on again, the NO SIGNAL message disappears and normal image display resumes.

Selection of PC Video Settings

Although the M1500 can display several different video modes, the optimum display image performance occurs when the PC's video settings match the native resolution of the M1500's LCD. For this reason it is recommended that you set the video mode to 1024 x 768 with a screen refresh rate of 60 Hz.

This can be done using Window's control panel or by right clicking on the desktop and choosing "Properties". This will bring up the "Display Properties" menu. From this menu, select the "Setting" tab and choose 1024 x 768 for the Screen resolution. From the Settings menu, choose "Advanced" and then click on the "Monitor" tab to set the Screen refresh rate to 60 Hz.

Installing the Touch Screen Driver Software

Drivers for the following operating systems are located on the enclosed CD:

Windows Vista*****

Windows XP

Windows 2000******

Windows Me

Windows 98

Windows 95

Windows NT 4.0******

DOS and Windows 3.x*******

Notes: ***** The driver for Windows Vista only supports USB touchscreen connections. RS-232 Serial touchscreen and multiple monitor connections are not supported.

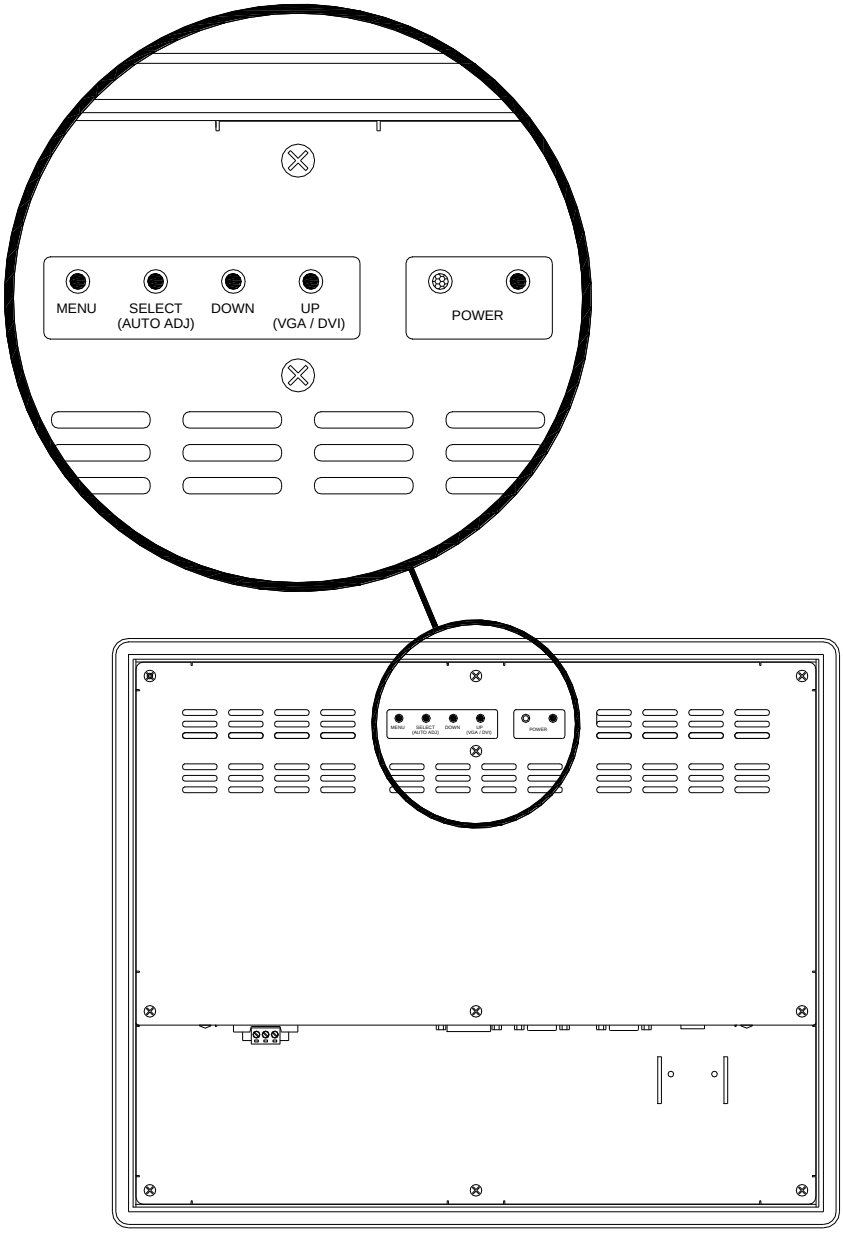
****** For Windows 2000 and NT 4.0 you must have administrator access rights to install the driver.

******* All of the drivers are self extracting and executing except for the DOS and Windows 3.x driver. This has an install.exe file that will need to be run.

Chapter 3. - Monitor OSD and Settings

On Screen Display (OSD) Controls

The OSD controls are used for making adjustments to the monitor's settings and are located on the back of the monitor. They consist of a single LED and five push buttons whose functions are described in the tables below.



Button and LED Functions

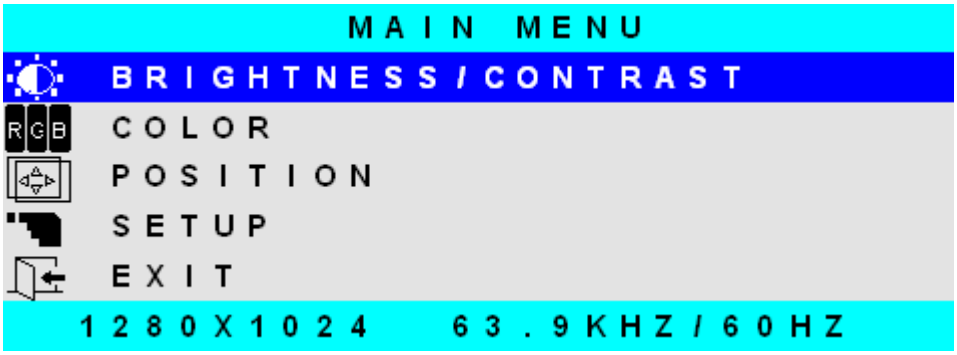
BUTTON	FUNCTION
POWER	Pressing this button once wakes the monitor up. Pressing the POWER button again turns off the back light inverter and puts the monitor in a reduced power state but the touch screen remains active. It is important to note that this switch does not disconnect power from the monitor. Power is always supplied to the internal AC/DC power supply (or the optional 24V DC to DC converter) which in turn, continually supplies power to the internal monitor electronics and the optional touch screen controller.
MENU	Pressing this button causes the main OSD menu to be displayed. Pressing it again will cause the Main OSD menu to disappear. If the button is not pressed a second time, the main OSD menu will disappear after the set timeout period.
SELECT (AUTO ADJ)	When the OSD main menu is displayed, pressing this button selects one of five sub-menus. Within a sub-menu, this button selects and deselects menu choices.
	HOT KEY: When the OSD is not displayed, pressing this button will initiate an automatic configuration and cause the “Processing Auto Configuration” message to be displayed.
DOWN	Within the main OSD menu and sub-menus, this button acts as an down cursor key, moving the highlighted item for selection to move downward to the next highlighted item for selection.
	When an item has been selected from a sub-menu, pressing this key decreases its value.
UP	Within the main OSD menu and sub-menus, this button acts as an up cursor key, moving the highlighted item for selection to move upward to the next highlighted item for selection.
	When an item has been selected from a sub-menu, pressing this key increases its value.

LED	FUNCTION
Not Lit	Power off mode.
Green	Monitor is on and receiving a normal video signal.
Amber	Monitor is on but in DPMS (Display Power Management Signaling) mode because it is not receiving a normal incoming video signal.

OSD Menus and Settings

MAIN MENU

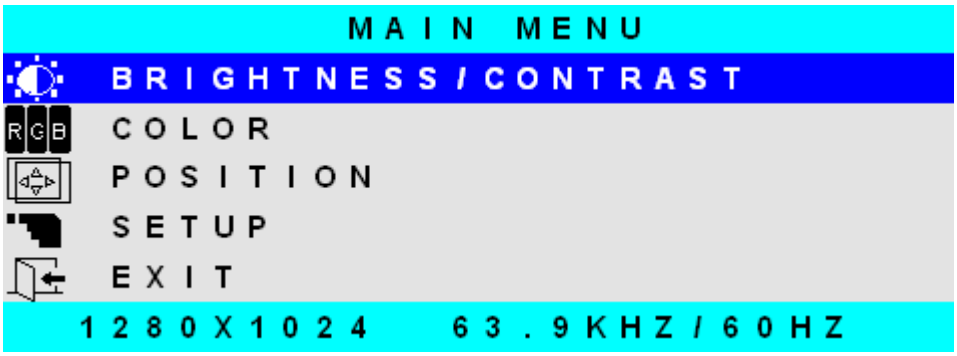
The following section describes the monitor's OSD menus and settings. With the monitor powered up and receiving a normal video signal, pressing the MENU button once will cause the following screen to appear:



Pressing MENU again will turn this screen off. Alternatively it will turn off after a time out period that is set in the SET UP sub-menu. Finally it can be turned off by pressing the DOWN button to move the blue highlighted band down to the EXIT sub-menu and pressing the SELECT button.

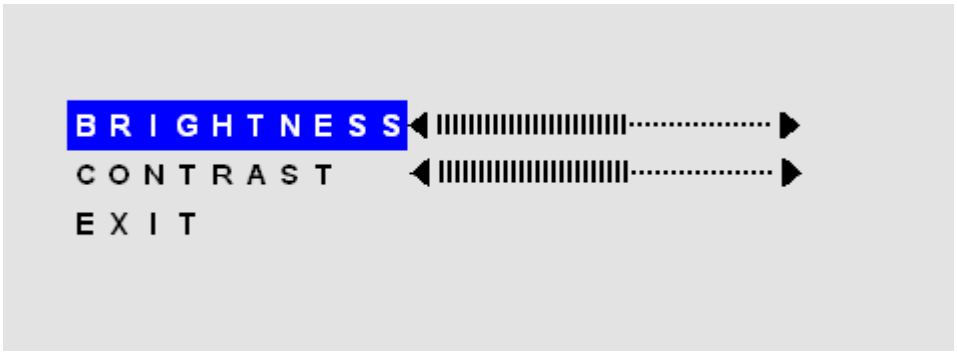
The bottom line on this screen displays the incoming video horizontal and vertical resolution and refresh rates.

BRIGHTNESS/CONTRAST



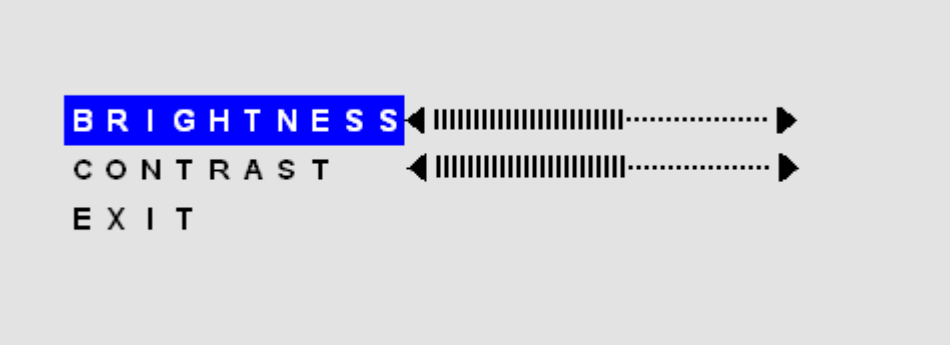
BRIGHTNESS

With BRIGHTNESS/CONTRAST highlighted on the MAIN MENU pressing SELECT will cause the following screen to be displayed:



Pressing the SELECT button will cause the following screen to be displayed:

Pressing the UP and DOWN buttons will adjust the brightness accordingly. Pressing the SELECT button again will deselect this function causing the following screen to appear:

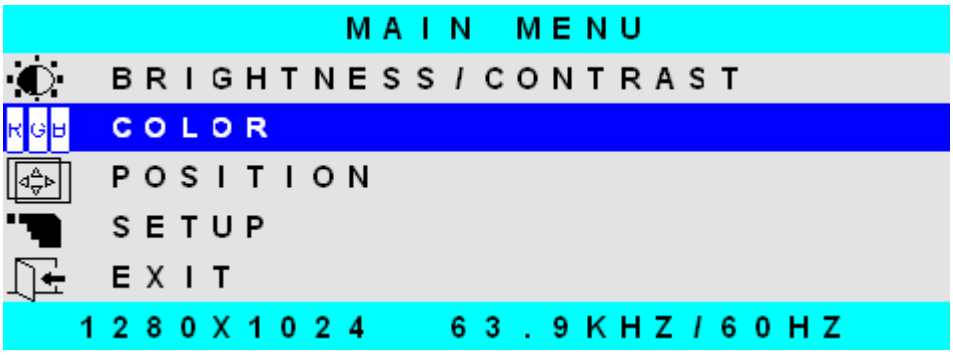


CONTRAST

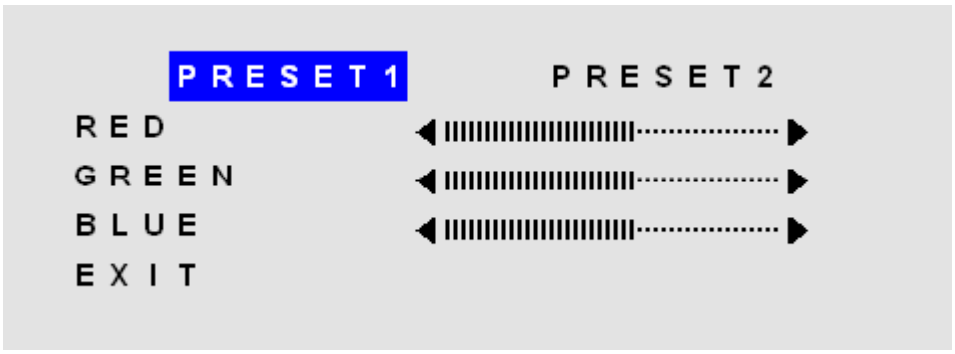
Pressing the DOWN button once and the SELECT button once will cause the following screen to appear:

Pressing the UP and DOWN buttons will adjust the contrast accordingly. Pressing the SELECT button again will deselect this function. Press the DOWN button to highlight EXIT and then pressing SELECT will return to the MIN MENU.

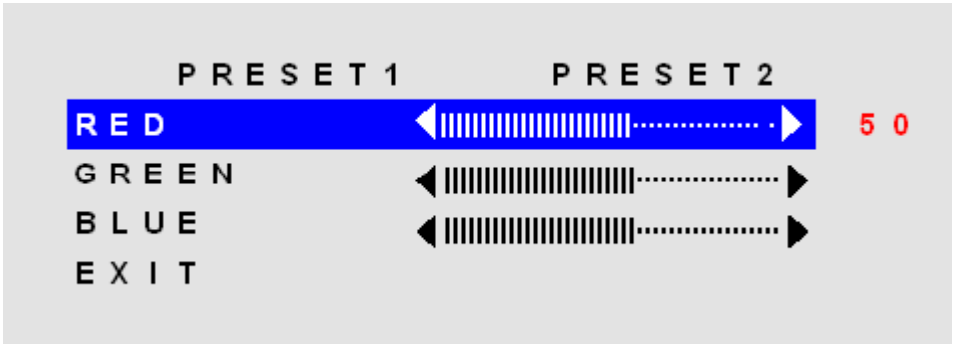
COLOR



With COLOR highlighted on the MAIN MENU pressing SELECT will cause the following screen to be displayed:

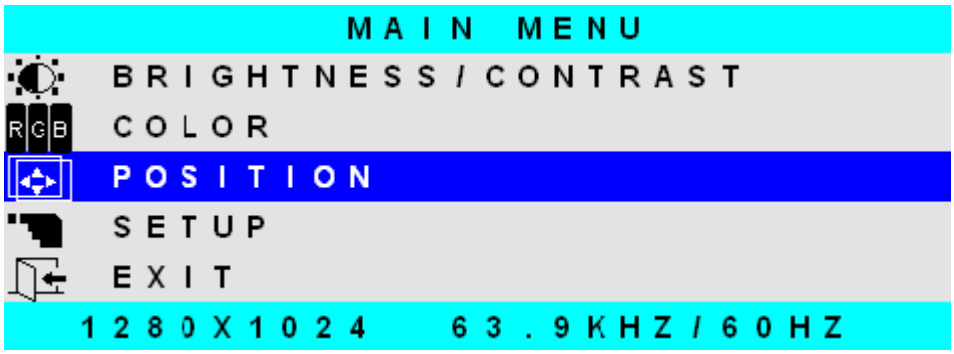


PRESET1 and PRESET2 are preset color balances. PRESET1 is produces a bluer screen while PRESET2 produces a more aqua screen. Use the UP and Down buttons to highlight PRESET1 or PRESET2 and press SELECT to make your selection and return to the MAIN MENU. If you highlight RED GREEN or BLU and press select, the following screen appears:

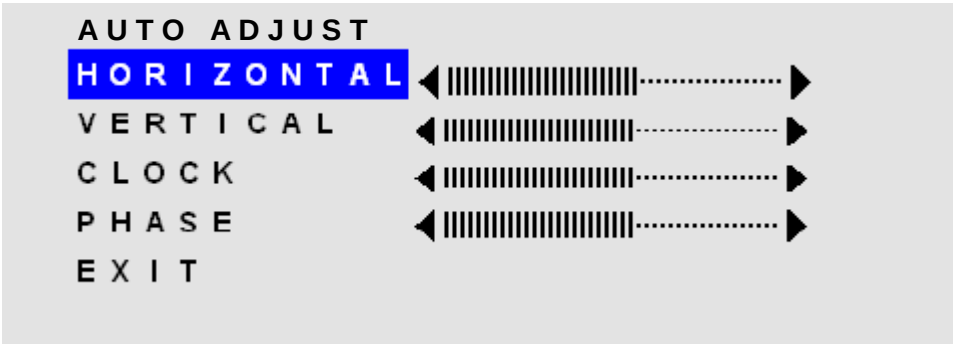


Pressing the UP and DOWN buttons causes the setting to change from the default of 50 to a value between 0 and 100. Pressing SELECT again saves the setting and deselects the menu item. Highlighting EXIT and pressing SELECT will return to the MAIN MENU.

POSITION

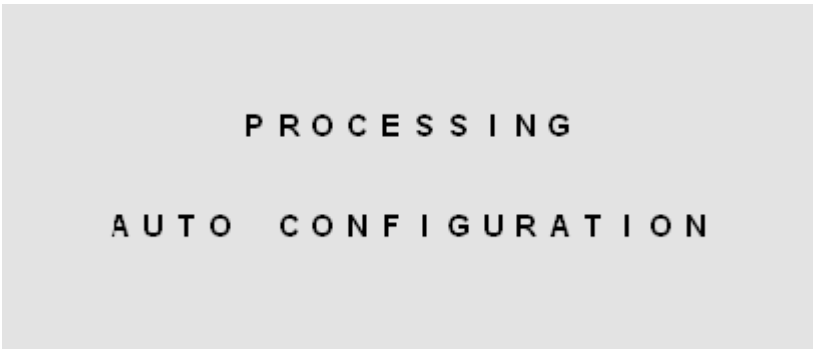


With POSITION highlighted on the MAIN MENU, pressing SELECT will cause the following screen to be displayed:



AUTO ADJUST

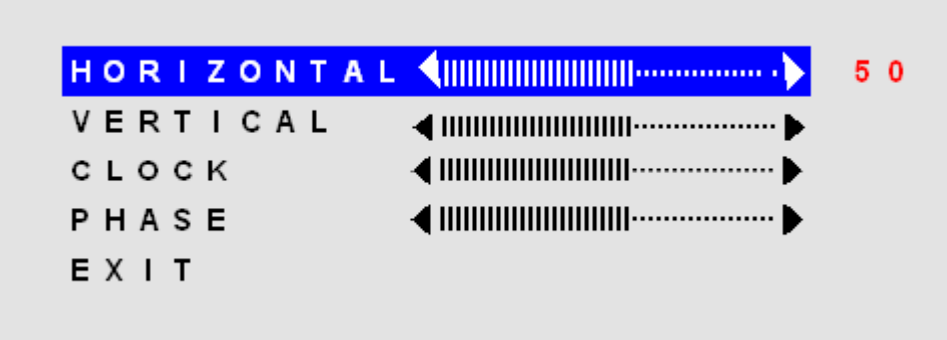
Highlighting AUTO ADJUST and pressing SELECT will initiate an automatic configuration and cause the “Processing Auto Configuration” message to be displayed.



During the auto configuration process, the monitor automatically centers the screen horizontally and vertically, sets the clock and optimizes the phase. After the process is complete, the screen is cleared of the OSD menu.

HORIZONTAL

With HORIZONTAL highlighted on the POSITION menu, pressing SELECT will cause the following screen to be displayed:



Pressing the UP button causes the screen to move to the right while pressing the DOWN button causes the screen to move to the left. A setting number in the range of 0 to 100 is displayed. Pressing SELECT again will deselect the HORIZONTAL menu option and the setting will be saved.

VERTICAL

With VERTICAL highlighted on the POSITION menu, pressing SELECT will display the VERTICAL adjustment menu. Pressing UP will cause the screen to move upward and pressing DOWN will cause the screen to move downward. A setting number in the range of 0 to 100 is displayed. Pressing SELECT again will deselect the VERTICAL adjustment menu and the setting will be saved.

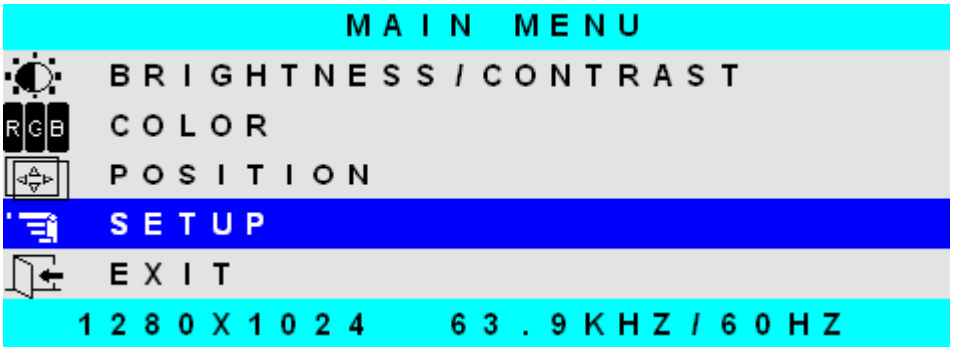
CLOCK

With CLOCK highlighted on the POSITION menu, pressing SELECT will display the CLOCK adjustment menu. Pressing UP increases the CLOCK and causes the screen to increase in width. Pressing the DOWN button causes the CLOCK to decrease and the screen to reduce in width. A setting number in the range of 0 to 100 is displayed. Pressing SELECT again will deselect the CLOCK adjustment menu and the setting will be saved. Adjustment of this setting is normally not needed as it is automatically set to its optimum setting each time the monitor is turned on or when AUTO ADJUSTMENT is selected.

PHASE

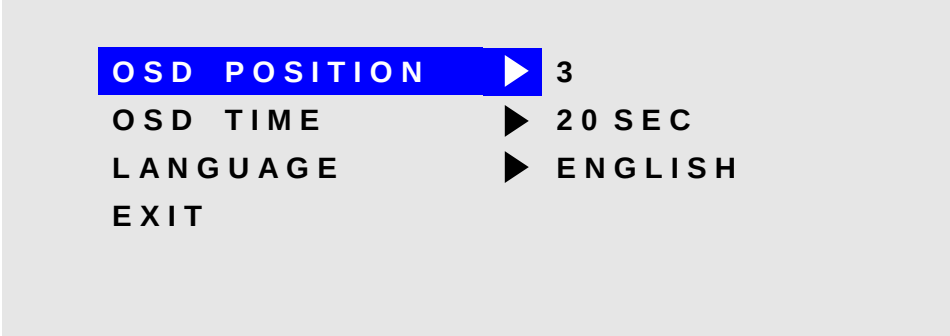
With PHASE highlighted on the POSITION menu, pressing SELECT will display the PHASE adjustment menu. Pressing UP increases the PHASE. Pressing the DOWN button causes the PHASE to decrease. A setting number in the range of 0 to 100 is displayed. Pressing SELECT again will deselect the PHASE adjustment menu and the setting will be saved. Adjustment of this setting is normally not needed as it is automatically set to its optimum setting each time the monitor is turned on or when AUTO ADJUSTMENT is selected.

SETUP

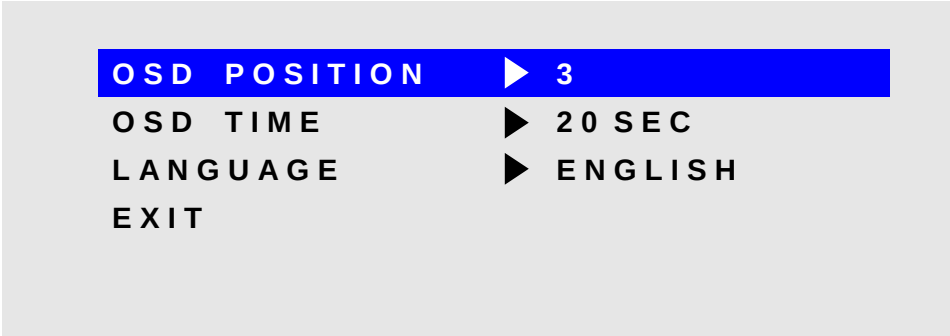


OSD POSITION

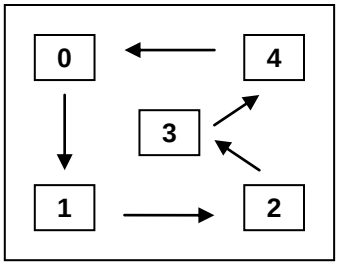
With SETUP highlighted on the MAIN MENU pressing SELECT will cause the following screen to be displayed:



With OSD POSITION highlighted on the SETUP menu, pressing SELECT will cause the following screen to be displayed:



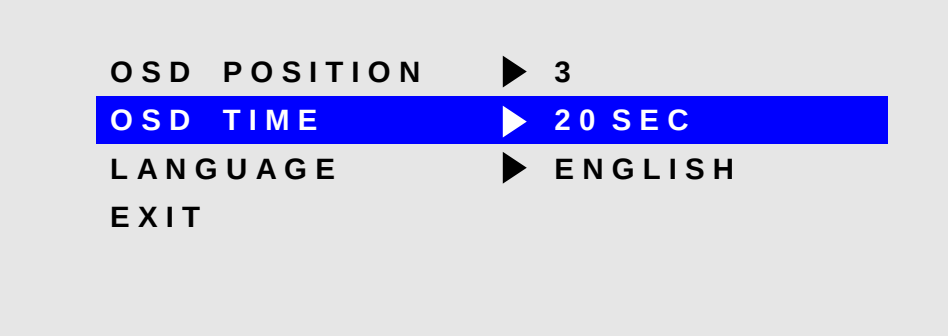
The default position of the OSD menu is 3 which is in the center of the screen. Pressing the UP or DOWN buttons will cause the OSD to move in the pattern below:



Pressing SELECT again will deselect the OSD POSITION adjustment menu and the setting will be saved.

OSD TIME

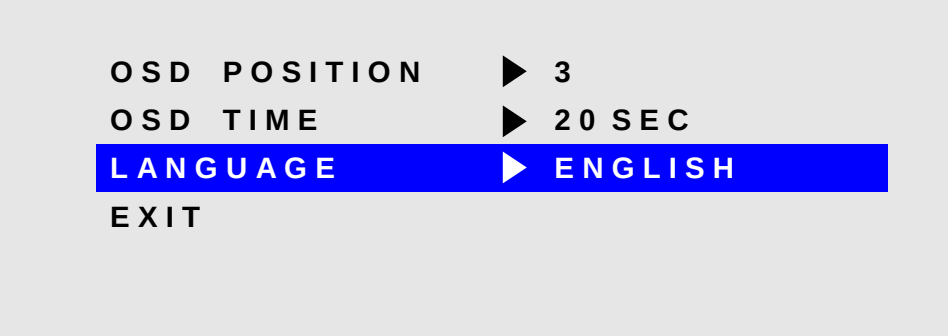
With OSD TIME highlighted on the SETUP menu, pressing SELECT will cause the following screen to be displayed:



Pressing the UP and DOWN buttons will the allow adjustment of the OSD time out setting in the range from 5 to 60 seconds. Pressing SELECT again will deselect the OSD TIME menu and save the current setting.

LANGUAGE

With LANGUAGE highlighted on the SETUP menu, pressing SELECT will cause the following screen to be displayed:



Pressing the UP and DOWN buttons allows the following LANGUAGE choices:

ENGLISH

FRANCAIS

DEUTSCHE

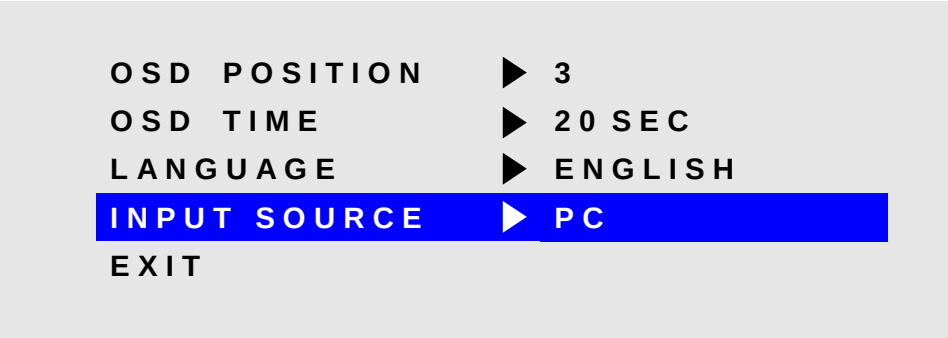
ITALIANO

ESPANOL

Pressing SELECT will deselect the LANGUAGE option menu and save the current selection.

INPUT SOURCE

With INPUT POSITION highlighted on the SETUP menu, pressing SELECT will cause the following screen to be displayed:

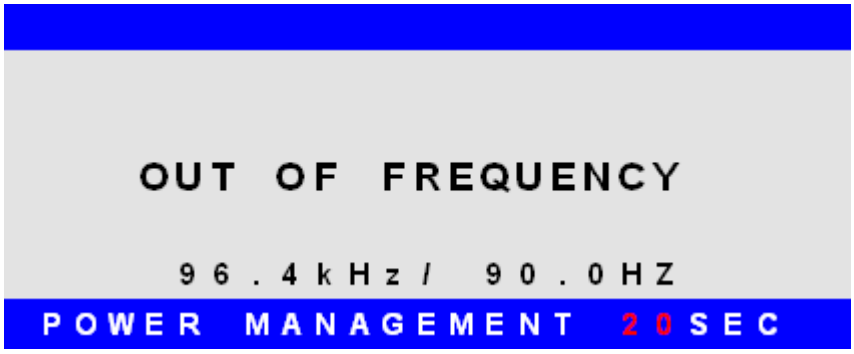


Pressing the UP and DOWN buttons switches between PC (the 15-pin analog VGA input connector) and DIGITAL (the DVI-D input connector) Pressing SELECT will deselect the INPUT SOURCE option menu and save the current selection.

OSD Message Displays

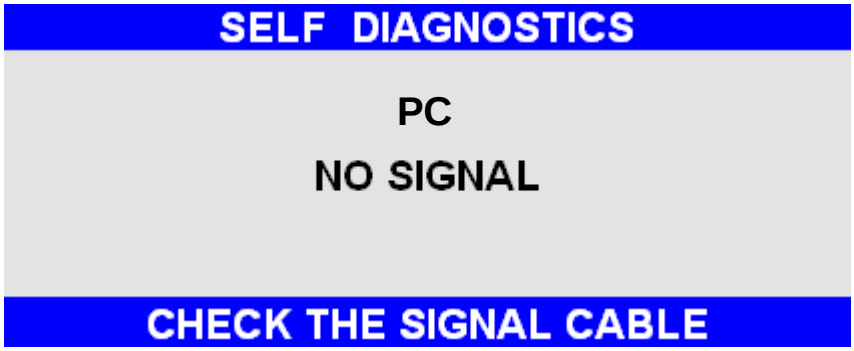
OUT OF FREQUENCY

The following OSD message will appear if the horizontal or vertical refresh rate of the incoming video signal is outside the range of the monitor.



NO SIGNAL

When the monitor is first turned on it performs a set of self diagnostics. If no incoming video signal is detected immediately following self diagnostics, the following message will appear. This message will remain indefinitely until a valid signal is detected. The LED remains green.



The “DIGITAL” NO SIGNAL message indicates the monitor is setup to receive incoming video through the DVI-D input connector.

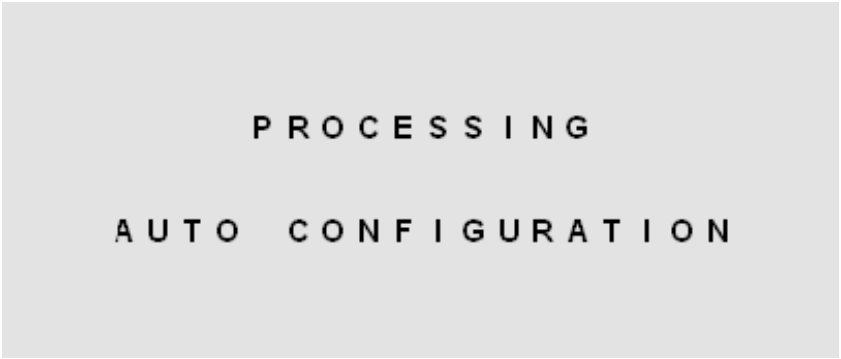
POWER SAVER MODE

The following message appears when the monitor is on but in DPMS (Display Power Management Signaling) mode. This occurs after a valid incoming video signal is no longer preset or when the PC has signaled the monitor to enter the POWER SAVER MODE. The message is displayed for 5 seconds and then removed. The LED remains amber.

The “DIGITAL” POWER SAVER MODE message indicates the monitor is setup to receive incoming video through the DVI-D input connector.

PROCESSING AUTO CONFIGURATION

The following message appears when the monitor is performing an automatic self configuration. An auto configuration can be initiated by pressing the SELECT button with no OSD screen being displayed or by selecting the AUTO ADJUST option from the POSITION OSD menu.



Appendix

VGA Input Pin Assignment

DVI-D

Pin No.	Name	Description
1	TMDS DATA2-	TMDS DATA2 Differential Negative Signal
2	TMDS DATA2+	TMDS DATA2 Differential Positive Signal
3	TMDS DATA2 Shield	Shield for TMDS Channel #2
4	N.C.	No Connection
5	N.C.	No Connection
6	DDC Clock	The Data Line for the DDC Interface
7	DDC Data	The Clock Line for the DDC Interface
8	N.C.	No Connection
9	TMDS DATA1-	TMDS DATA1 Differential Negative Signal
10	TMDS DATA1+	TMDS DATA1 Differential Positive Signal
11	TMDS DATA1 Shield	Shield for TMDS Channel #1
12	N.C.	No Connection
13	N.C.	No Connection
14	+5V Power	+5 Volt signal for EDID
15	GND (+5V Return)	Ground for +5 Volt Power
16	HPD	Hot Plug Detect
17	TMDS DATA0-	TMDS DATA0 Differential Negative Signal
18	TMDS DATA0+	TMDS DATA0 Differential Positive Signal
19	TMDS DATA0 Shield	Shield for TMDS Channel #0
20	N.C.	No Connection
21	N.C.	No Connection
22	TMDS CLOCK Shield	Shield for TMDS Clock Differential Pair
23	TMDS CLOCK+	TMDS CLOCK Differential Positive Signal
24	TMDS CLOCK-	TMDS CLOCK Differential Negative Signal

Analog 15- Pin D-Sub

Pin No.	Name	Description
1	Red	Red Analog Data
2	Green	Green Analog Data
3	Blue	Blue Analog Data
4	GND	Ground
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	N.C.	No Connection
10	GND	Ground
11	GND	Ground
12	DSDA	DDC Serial Data
13	HSYNC	Horizontal Sync
14	VSYNC	Vertical Sync
15	DSCL	DDC Serial Clock

Touch Screen Pin Assignment

Serial RS-232

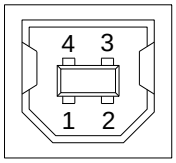
Pin No.	Name	Description
1	DCD	Data Carrier Detect
2	RX	Receive Data
3	TX	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator

Baud Rate	9600
Data Size	8 Bits
Stop Bits	1 Bit
Parity	No Parity (Only)
Handshaking	Hardware CTS/RTS

USB

Pin No.	Name	Description
1	VBUS	+5V Power
2	USB_D−	USB Data −
3	USB_D+	USB Data +
4	GND	Ground

USB-B CONNECTOR ON REAR OF MONITOR



Note: The touch controller receives it power from the monitor's internal power supply – not through the USB connector.